

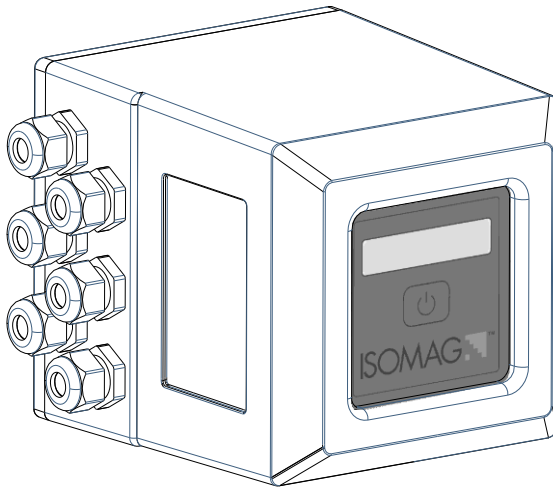
ISOMAG™

The friendly magmeter

OPERATING AND MAINTENANCE MANUAL

ELECTROMAGNETIC FLOWMETER CONVERTER

MODEL: ML 145



Release number: 145_EN_IS_R0_3.00.0XXX.docx – The characters of file name in bolt type indicate the software version which the manual refers to; it is visualized at the instrument start up, or by specific function on DIAGNOSTIC menu.

INDEX

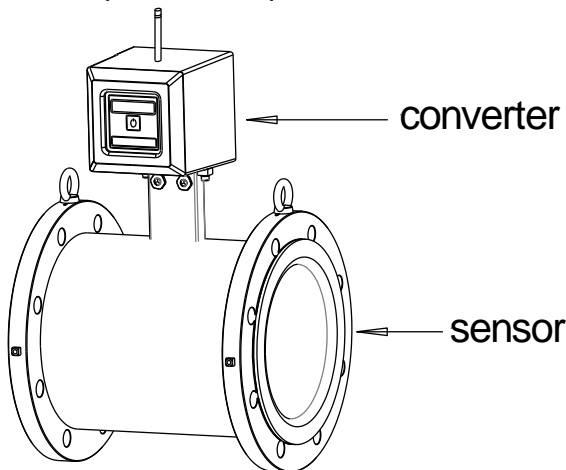
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INTRODUCTION

These operating instructions and description of device functions are provided as part of the scope of supply. They could be modified without prior notice. The improper use, possible tampering of the instrument or parts of it and substitutions of any components not original, renders the warranty automatically void.

The converter is to be used only to be coupled with a sensor to realize a measuring device, flow meter, that is to be used for measuring the flow of conductive liquids in closed pipes with conductivity greater than $5\mu\text{S}/\text{cm}$.

The converter could be coupled directly on the sensor (compact version) or coupled to the sensor by cable supplied with it (remote version).



The reproduction of this manual and any supplied software is strictly forbidden.

SAFETY INFORMATIONS

Any use other than described in this manual affect the protection provided by the manufacturer and compromises the safety of persons and the entire measuring system and is, therefore, not permitted.

The manufacturer is not liable for damaged caused by improper or non-designated use.

- 1) Transport the measuring device to the measuring point in the original packaging. Do not remove covers or caps until immediately before installation. In case of cartons packaging it is possible to place one above the other but no more than three cartons. In case of wooden packaging do not place one above the other.
- 2) Disposal of this product or parts of it must be carried out according to the local public or private waste collection service regulations.
- 3) The converter must only be installed, connected, commissioned and maintained by qualified and authorized specialists (e.g. electrical technicians) in full compliance with the instructions in these Operating Instructions, the applicable norms, legal regulations and certificates (depending on the application).

- 4) The specialists must have read and understood these Operating Instructions and must follow the instructions it contains. The Operating Instructions provide detailed information about the converter. If you are unclear on anything in these Operating Instructions, you must call the ISOIL service department.
- 5) Repairs may only be performed if a genuine spare parts kit is available and this repair work is expressly permitted.
- 6) The converter should only be installed after have verified technical data provided in these operating instructions and on the data plate.
- 7) Specialist must take care during installation and use personal protective equipment as provided by any related security plan or risk assessment.
- 8) Never mount or wire the converter while it is connected to the power supply and avoid any liquid contact with the instrument's internal components.
- 9) Before connecting the power supply check the safety equipment functionality.
- 10) For the cleaning of the device use only a damp cloth, and for the maintenance/repairs contact the service center (for details see the last page).
- 11) To return the product back for service complete and return the meter with form found in the last pages of these operating instructions.

Before starting up the equipment please verify the following:

- Power supply voltage must correspond to that specified on the data plate
- Electric connections must be completed as described
- Ground (earth) connections must be completed as specified

Verify periodically (every 3-4 months):

- The power supply cables integrity, wiring and other connected electrical parts
- The converter housing integrity
- The suitable tightness of the sealing elements
- The front panel integrity (display and keyboard)
- The mechanical fixing of the converter to the pipe or wall stand.

SAFETY CONVENTIONS



DANGER

Warning indicates an action or procedure which, if not performed correctly, can result in injury or a safety hazard. Comply strictly with the instructions and proceed with care.



WARNING

Caution indicates an action or procedure which, if not performed correctly, can result in incorrect operation or destruction of the device. Comply strictly with the instructions.



NOTES

Note indicates an action or procedure which, if not performed correctly, can have an indirect effect on operation or trigger an unexpected response on the part of the device.

TECHNICAL CHARACTERISTICS



ELECTRIC CHARACTERISTICS

Instrument classification: class I, IP 67, overvoltage category II, rated pollution degree 2

Power supply version	Power supply	Power supply frequency	Max power
AU	18-30V $\overline{\text{---}}$ *	//	1W
LITHIUM BATTERY NOT RECHARGEABLE	3.6V-19Ah	//	200mW

* Voltage variations must not exceed $\pm 10\%$ of the nominal one.



ENVIRONMENTAL USE CONDITIONS

- The converter can be installed internally or externally
- The direct exposure to the solar rays could damage the liquid crystals display
- Altitude: from -200 to 4000 m (from -656 to 13120 feet)
- Humidity range: $0-100\%$ (IP 67)

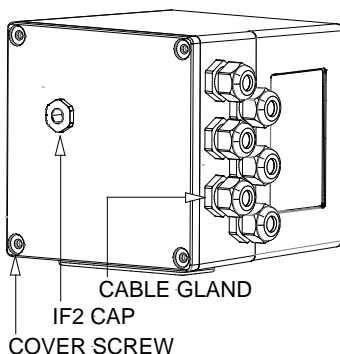
OPERATING TEMPERATURE

Min.*		Max	
$^{\circ}\text{C}$	$^{\circ}\text{F}$	$^{\circ}\text{C}$	$^{\circ}\text{F}$
-20	-4	60	140

If the converter is supplied in compact version to the sensor, consider the operating temperatures more restrictive, otherwise refer to the respective manuals.
For discontinuous use, a thermostat heat source installation may be necessary.



TORQUES

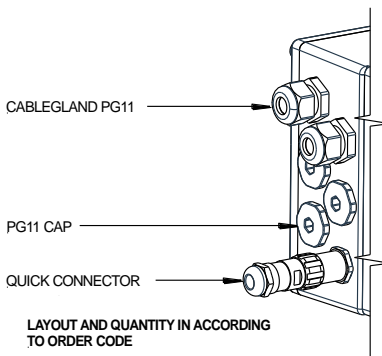
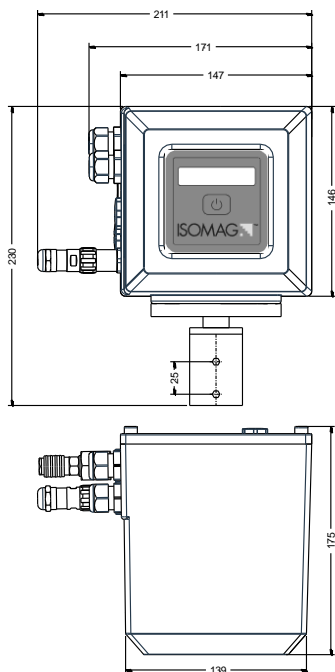


To guarantee the IP housing degree the following torques are required:

- cover screws: 1.5Nm
- cable glands: 4Nm (in reference conditions)
- IF2 cap: 4Nm

To locate the terminal blocks loosen the 4 screws on the back cover.

OVERALL DIMENSIONS AND WEIGHTS




Aluminium housing weight: 3Kg;
 Stainless steel housing weight: 3.5kg
 Weights refer to the converter without battery (each battery weights 0.1kg),
 which can be provided with 6 batteries maximum and without display,
 blind configuration.

Data plate

On the data plate there is some technical information:

- **MODEL:** Converter Model
- **SERIAL N:** Serial Number of the converter
- **PW. TYPE:** Type of power supply:
 - LITHIUM=lithium battery
 - AU= Universal power supply
 - LITH+AU=lithium battery/es + Universal power supply
- **PW SUPPLY:** Main power supply
- **MAX POWER:** Maximum power consumption
- **Hz:** Supply frequency (AC)
- **T:** Operating temperature
- **IP:** Protection grade
- **COUP:** Serial number of sensor coupled
- **ITEM:** free for user

 Grottole (BI) - ITALY www.isoil.com	
MODEL	Model
SERIAL N	Serial
PW TYPE	PowerType
PW SUPPLY	Power
MAX.POWER	PowerMax
HZ	Hz
T	T
IP	Ip
COUPLING	Coupling
ITEM	Item

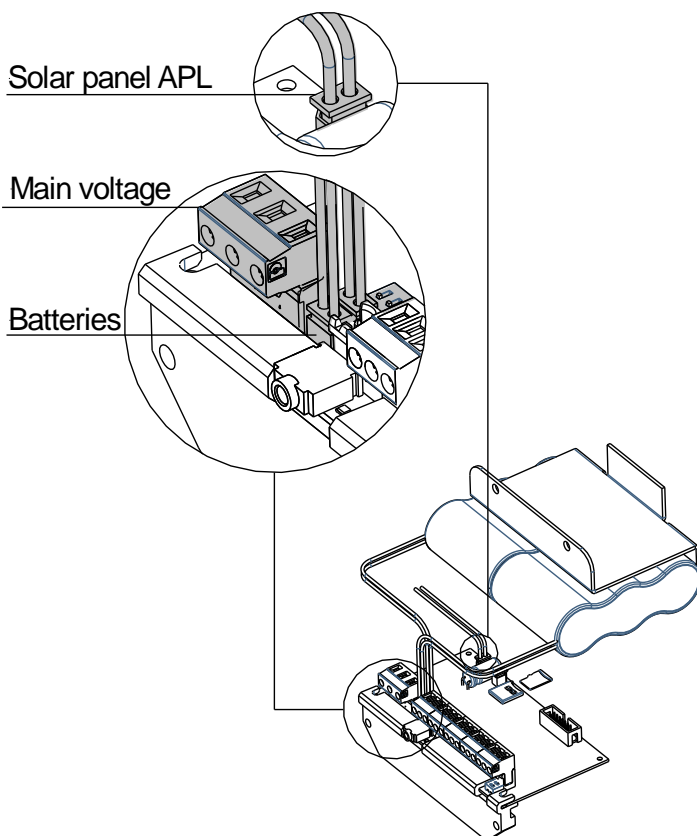
CE

CONVERTER POWER SUPPLY

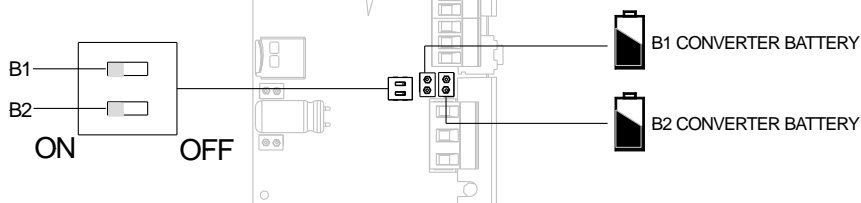
ML145 can be supplied in three different mode:

- by batteries
- by mains voltage OPTIONAL
- by solar panel (APL) OPTIONAL

Below are shown the Terminal on PCB of the three different power supply



POWER SUPPLY BY BATTERIES

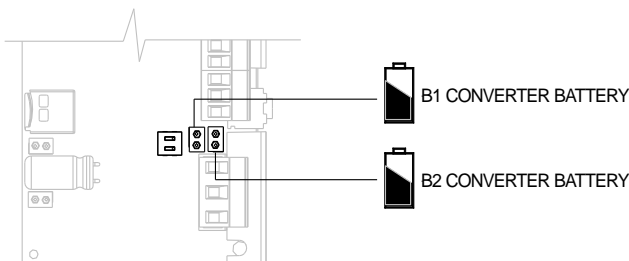


To replace the batteries contact the service

Note : Lithium batteries are subject to special transportation regulations according to "Regulation of Dangerous Goods, UN3090 and UN 3091". Special documentation is required to observe these regulations.



BATTERIES CHARGE STATUS



Pic. 1

B1: 0% *B2:99%

Pic. 2

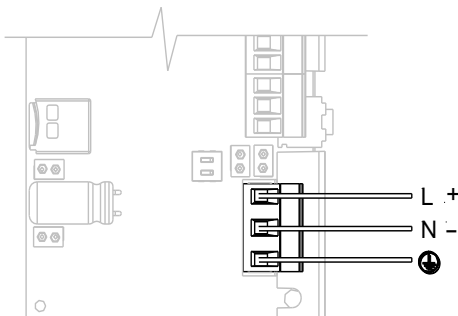
ALARM 3/3:
B1 LOW

- Actual batteries charge status: picture 1.
- In case of dual battery pack (B1&B2) the converter will draw power from battery pack no. 2 (B2) first, until it is consumed, then will switch automatically on battery pack no. 1 (B1), giving a BATTERY LOW warning. In this case B1 is considered as a backup battery. In case of a single battery pack (B1) use B1 slot ALWAYS.

IMPORTANT NOTE: Initially, if the converter has not been powered up for a prolonged period a 'BATTERY LOW' message may appear. This is a temporary and normal response while the batteries chemical reaction takes place (2-3 hours), the battery will reach the right value.



POWER SUPPLY BY MAINS VOLTAGE (OPTIONAL)



- ❑ Before connecting the power supply, verify that the mains voltage is within the limits indicated on the data plate.
- ❑ For the connections use only approved conductors (unsheathed as few as possible), with fire-proof properties, whose section varies from 0.25mm^2 to 2.50mm^2 , based on distance/power; additionally fix the power supply wires with an additional fastening system located close to the terminal.
- ❑ The power supply line must be equipped with an external protection for overload current (fuse or automatic line breaker).
- ❑ Provide in close proximity the converter a circuit breaker easy accessible and clearly identified for the operator; whose symbols must conform to the electrical safety and local electrical requirements.
- ❑ Check chemical compatibility of materials used in the connection security systems in order to minimize electrochemical corrosion.

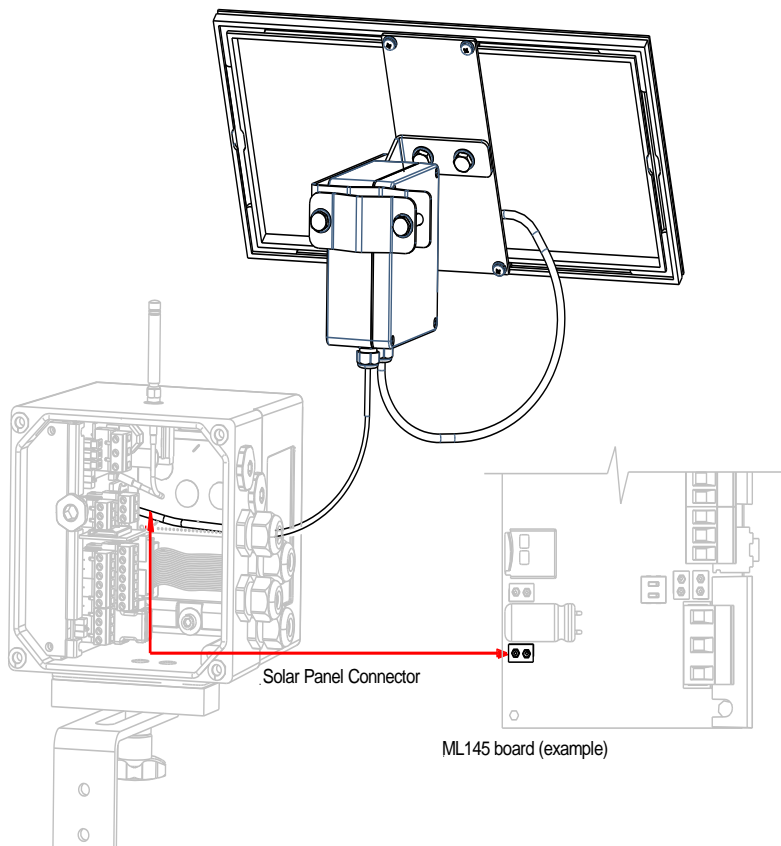
The ML145 is not intended to be powered on and off repeatedly; the unit will protect itself against wrongly operation on power supply and will not turn on until all the internal voltages are ok.

The good way to switch ON and OFF the unit safely, is to use the stand-by function (main menu 10). In this way the charge is preserved, the data are saved correctly and the unit will turn on surely when the keyboard is pressed for 10 seconds.

When the converter is connected to the mains power supply, **the converter will not** draw power from the batteries; besides the converter will sample at the maximum rate (continuous sampling).



POWER SUPPLY SOLAR PANEL APL (OPTIONAL)



The APL module allows to power up the instruments of Flowiz family through a photovoltaic module. The system is composed by :

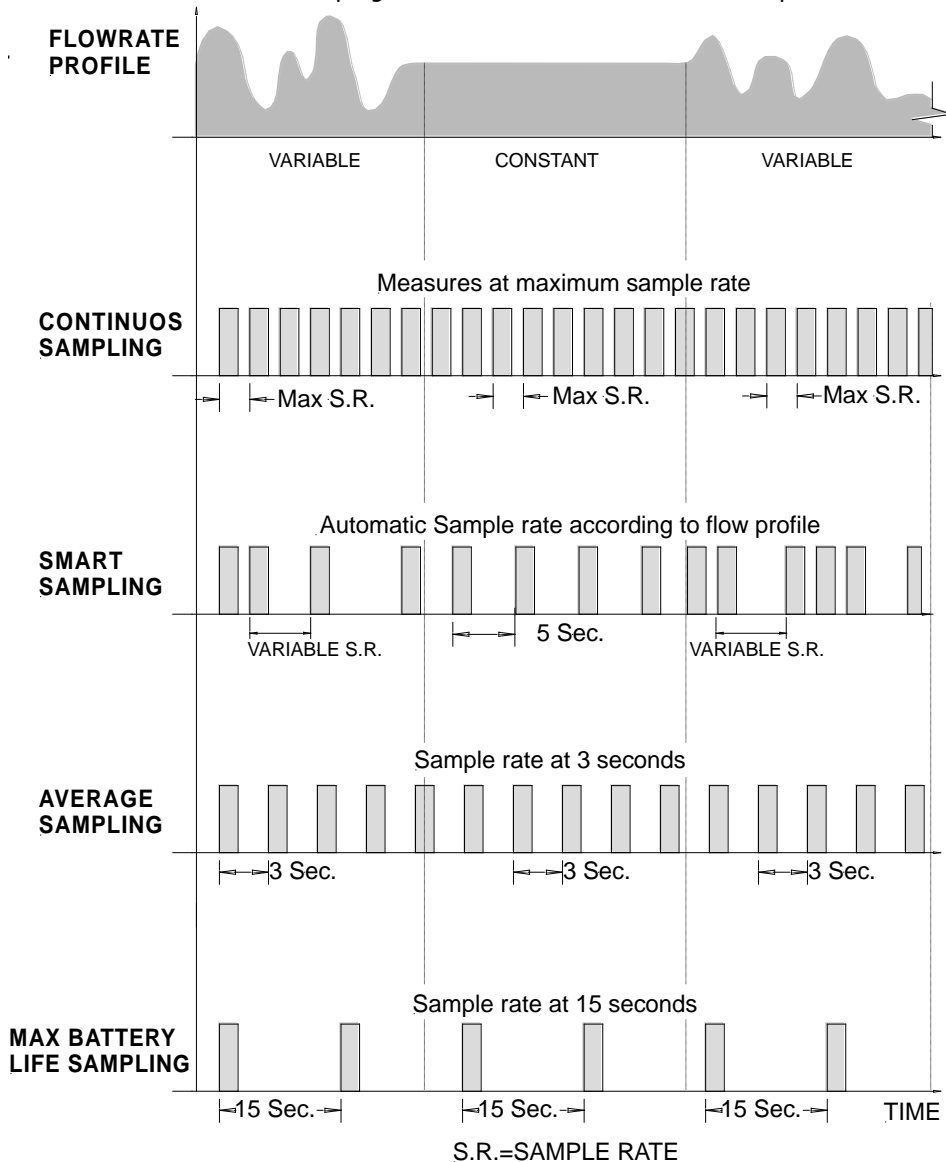
- One photovoltaic panel that converts directly sunlight into electrical energy
- One electronic circuit that use the energy supplied by the module for charging the battery
- One rechargeable battery already mounted inside the APL's electronic housing

Once the APL cable is connected to the Flowiz connector (example above), it detect the presence of module and automatically switch in "CONTINUOUS" mode, whatever is the measure profile set; this solution allows accurate measurements (flow/ pressure) even if they varies continuously. Moreover, if the instrument is equipped with GPRS module, the APL allows to keep the modem continuously connected to the network, getting a "almost real time" device.

See **APL manual** for installation of solar panel and **Power Tool** software to estimate the solar panel charge

MEASUREMENT SETTINGS

The ML 145 converter can be programmed to measure in four different profiles:



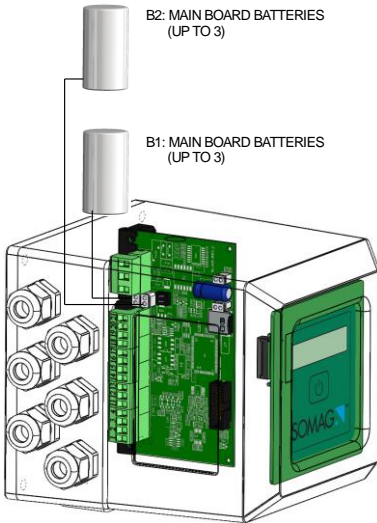
Factory pre-setting = SMART MODE

The functioning "continuous sampling" is allowed only if the function ENSVE=OFF (function available only with ISOCON)

POWER CONSUMPTION

The batteries consumption depends from the setting of the followings elements: main board, sampling interval (measure profile), sensor diameter, frequency of data delivery, amount of data collected, interface activities (display).

Special software to calculate the consumption is available; here below a simple scheme to evaluate the different "consumption's rate" of each element.



DISPLAY ACTIVITIES

B1/B2

INTERFACE ACTIVITIES AND STORAGE DATA

B1/B2

MAIN BOARD IN STANDBY

B1/B2

SAMPLING INTERVALS

B1/B2

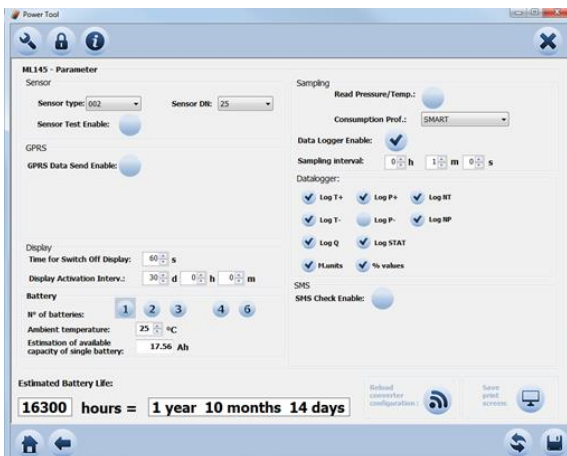
B1/B2

B1/B2

B1/B2

B1/B2

POWER TOOL SOFTWARE



Power tool is a software which allows to evaluate the converter battery life. The estimation is done with an easy guided procedure

Low power consumption: a number of design strategies have been employed to achieve exceptionally low power consumption. However, the length of time between battery changes depends on a quality/status of batteries, the frequency of sampling and logging.



ELECTRICAL CONNECTIONS

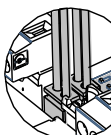
INTERNAL VIEWS OF THE CONVERTER

SOCKET FOR ALTERNATIVE POWER SUPPLY
(SOLAR PANEL OR COMMERCIAL BATTERIES)

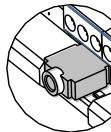


SWITCH ON/OFF CONVERTER DIP-SWITCHES

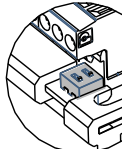
TERMINAL SOCKETS FOR BATTERIES



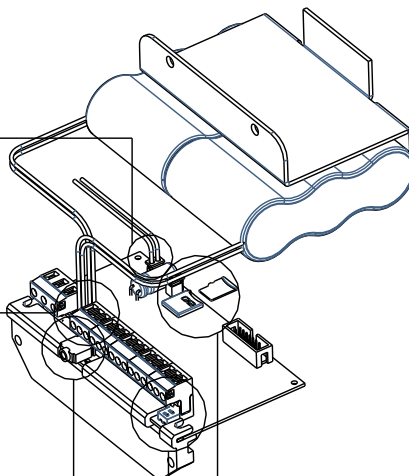
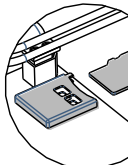
TERMINAL SOCKETS FOR IF23



SWITCH ON/OFF INPUT POWER SUPPLY



SOCKET FOR SD MEMORY CARD



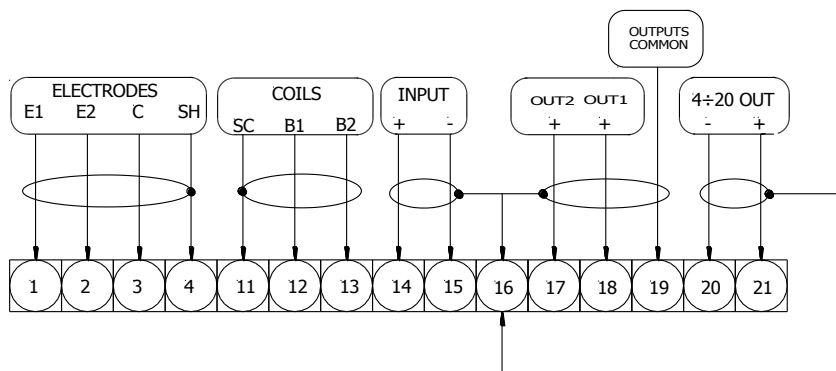
The sensor, hardwired inputs and outputs are connected to the converter through the terminal blocks.

To locate the terminal blocks remove the rear protecting cover plate, removing the 4 fixing screws (5mm allen key)

When the cover is removed the terminal blocks are visible. These terminal are the converter hardwire connections to the external equipment, including the sensor.

The following pages give information of numbering, and the respective connecting of the sensor cables, and input/outputs.

TERMINAL BLOCKS M1



LEGEND

E1-2: electrode 1-2

B1-2: coil 1-2

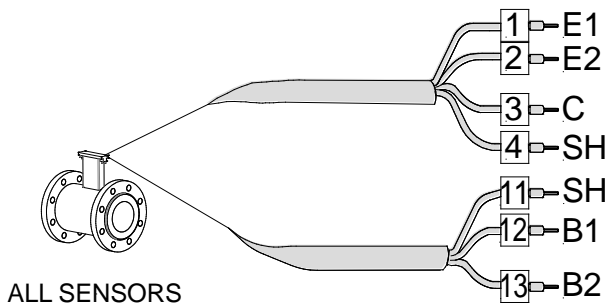
C: common

SH: Cable shield, electrically connected to ground and to the housing

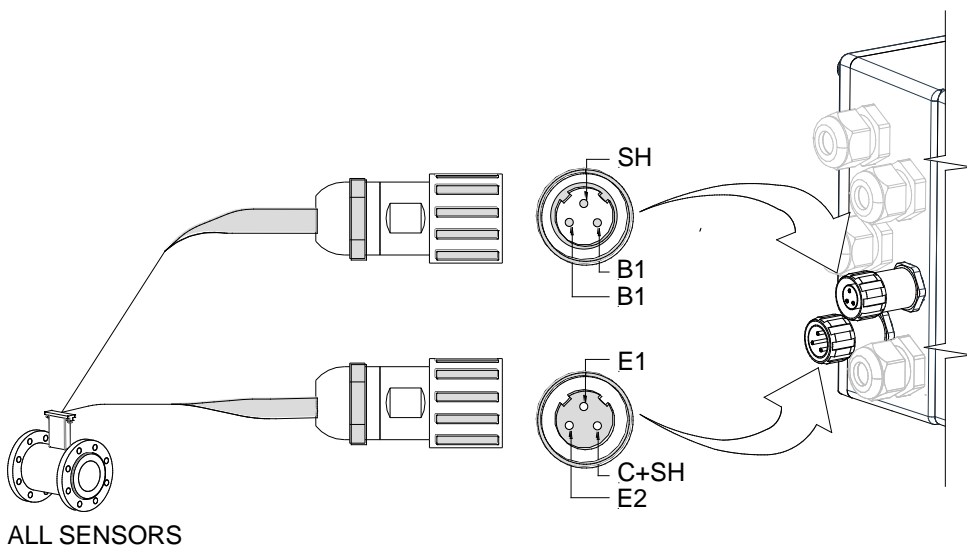


SENSOR-CONVERTER CONNECTIONS

SEPARATE VERSION WITH NORMAL CABLES



SEPARATE VERSION WITH CONNECTORS



CABLES MUST BE PLACED INSIDE A METALLIC CONDUIT AND ELECTRICALLY CONNECTED TO THE CONVERTER HOUSING AND GROUND (EARTHED)! MAX CABLE LENGTH: 20m

NOTICE: sudden movements of the electrode cable can cause noise on the measure.

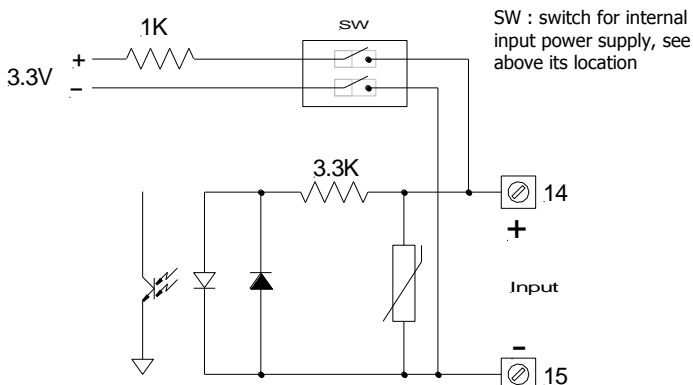
OPTIONAL DIGITAL INPUT



INPUTS INSULATION

- Inputs are insulated up to 500V

ELECTRIC WIRING

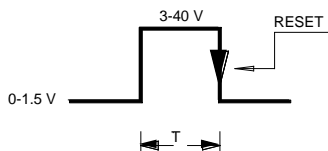


ON/OFF INPUT FUNCTIONS

Several functions of the converter can be controlled through the application of an input voltage (see menu input); the duration of voltage input T_{min} must be 500ms as minimum; the scheme below indicate how the input works:

- Falling front
- Input status

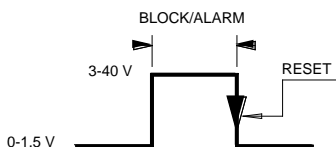
Totalizer reset/Board calibration



Necessary conditions to perform the function:

- $T > 0.5$ sec.
- POS. 5.1-5.4 ENABLED at least one total or partial, positive or reverse flow totalizer reset enable and/or
- POS. 5.6 ENABLED

Alarm/Block total./Wake-up



Necessary conditions to perform the function:

- POS. 5.5 ENABLED and/or
- POS. 5.8 ENABLED

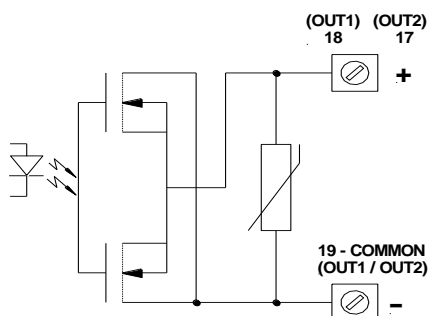
OPTIONAL DIGITAL OUTPUTS



OUTPUTS INSULATION

- outputs are insulated up to 500V

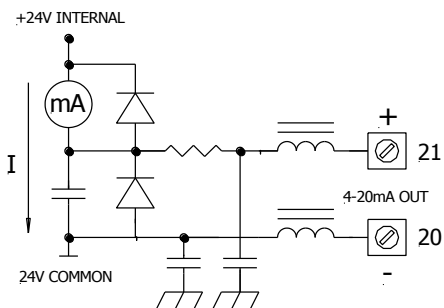
DIGITAL OUTPUT



Technical characteristics

- Opto-insulated output (Opto-MOS)
- Maximum switching voltage: 40V $\overline{\text{---}}$ / 28V \sim
- Maximum switching current: 100mA
- Maximum Ron = 70 Ω
- Maximum switching frequency (load RL=240 Ω , VOUT=24V $\overline{\text{---}}$): 50Hz
- Insulation from other secondary circuits: 500V $\overline{\text{---}}$

OUTPUT 4÷20mA (ACTIVE)



Technical characteristics

- Opto-insulated output
- Maximum load 500 Ω
- Maximum voltage without load 27V $\overline{\text{---}}$
- Protected against persistent over voltages till 30V $\overline{\text{---}}$

DISPLAY FLAGS

FLAGS

dm³/s +0.0000 !
+0.00%-----

At 'Power on' of the converter, the user will see the following display screen. In the top right hand corner there a range of symbols. The symbols can be interpreted from the table below. Interpretation of the flashing LED can be made from the LED Interpretation table at the bottom of this page.

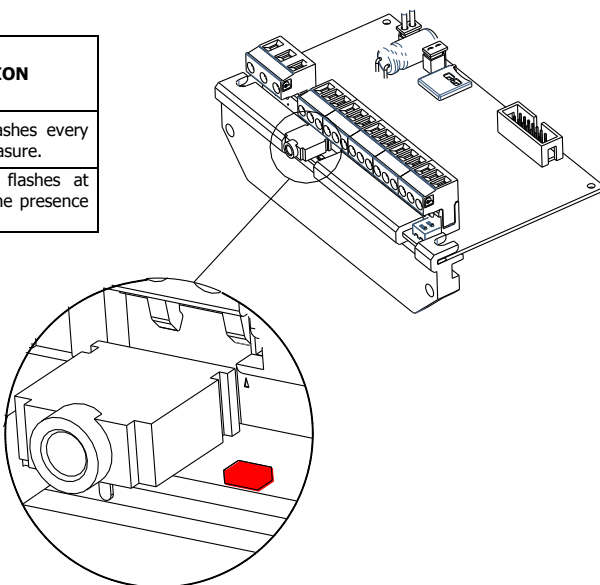
FLAGS INTERPRETATION	
FLAG	DESCRIPTION
↕	- Max/min alarm activated
C	- Calibration running
S	- Simulation
!	- Alarm signal SEE PAGE 35

LED WARNING INTERPRETATION

LED INTERPRETATION

The LED of main board flashes every time the meter perform a measure.

When the LED converter flashes at approx 1 Hz, this indicates the presence of an alarm (see page 35)



ACCESS TO THE CONVERTER KEYPAD

KEYPAD



SHORT PRESSING (< 1 SECOND):

Change the display of the process data

LONG PRESSING (> 1 SECOND):

Wake up display

SCREENS DISPLAYED



Note: The user will see the screen displayed (below) at power on. Use the key as indicated to move between the screens.

FLOWRATE VALUE / % FULL SCALE GRAPHIC OF FLOW RATE-TIME

```
dm³/s +4.6166
+92.33%■■■■■L
```

TOTAL AND PARTIAL TOTALIZER OF DIRECT-INVERSE FLOWRATE

```
T+dm³ 604.255
P+dm³ 604.255

T-dm³ 246.343
P-dm³ 246.343
```

TOTAL AND PARTIAL NET TOTALIZER

```
TNdm³ 795.370
PNdm³ 795.370
```

FLOWRATE VALUE PARTIAL DIRECT INVERSE TOTALIZER

```
dm³/s +4.6018
P+dm³ 1124.553

dm³/s +4.6000
P-dm³ 246.343
```

FLOWRATE VALUE SPEED RATE BAR GRAPH

```
dm³/s +4.5996
m/s 9.37■■■■■L
```

ALARMS STATUS

```
ALARM 1/1:
FLOW>FS
```

BATTERY STATUS

```
*B1:99%
```

ALTERNATE VIASUALIZATIONS

```
=====>
<=====
```

NOTE: The maximum digits shown by the totalizer is 999999999 regardless of the number of user selected decimals (see page 27 Pos 2.3). Beyond this value the totalizers are reset to zero.



FLOW RATE VISUALIZATION

```
dm³ / s   +4.6018
P+dm³     1124.553
```

The ML 145 can show a 5 digit character display for flow rate units.

The maximum flow rate value that can be displayed is **99999** (irrespective of and subsequent decimal point positioning), the minimum is **0.0001**

The converter's maximum allowable flow rate is based on the following formula calculation relating to the pipe **Nominal Diameter**:

- **$ND \times ND \times 0.008$**

The result of above calculation gives the maximum flow rate **at a liquid flow speed of 10m/s** according to sensor diameter; the permitted units to be displayed are the unit of measure that, paired to calculated value, do not exceed the number **99999 (higher limit); the lower limit is 0.0001. This flow rate value can be used as the full scale if the value is not less than 1/25th of flow rate calculated at 10m/s (FS max);**

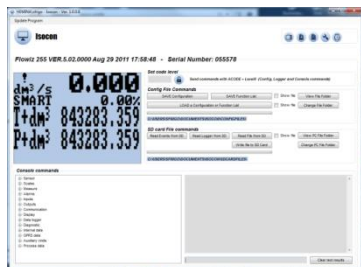
Example for DN 200:

- Full scale value: $200 \times 200 \times 0.008 = 360 \text{ l/s}$
- **PERMITTED** measure unit (example): m^3/s (0.3600)
- **NOT PERMITTED** measure unit (example): cm^3/s (360000)

ACCESS TO THE CONFIGURATION MENUS

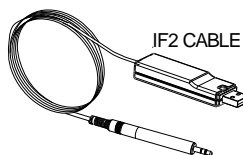
The converter's configuration menus can be accessed only by **ISOCON** interface

ACCESS TO THE CONFIGURATION MENUS BY ISOCON INTERFACE



Isocon allow to set all the converter functions; see suitable manual for more details. (Cable and software required)
Being the housing closure dependent by the installer, the IP degree may be compromised, so follow the torques mentioned.

It is recommended to disconnect the IF2 cable from the converter after every use.



QUICK START MENU

Functions can be accessed by the keyboard in two different ways:

- The **"Quick start menu"** makes direct access possible to a range of principal functions for setting the scale reading and display characteristics of the sensor.

```
0-QUICK START
Fs =dm³/s 5.0000
```

Quick start menu can be enabled by function 8.3 (menu display)

Factory pre-setting: QUICK START MENU=ON

- Through the **"Main menu"** it is possible to access functions with the access code level 2. These control the sensor's monitoring, data processing, input/output as well further display options.

```
MAIN MENU
1-Sensor
```

The following example shows how to change the Full scale by "Quick Start" menu; the second illustrates how to change the function by the 'Main menu'.

EXAMPLE: "Quick start menu" function modification. Full scale value 1 (Fs1) from 4dm³/s to 5dm³/s.

1 dm³/s +0.000 1
m/s 0.00-----

Enter in the "Quick start menu"

ent

2 0-QUICK START
s1=dm³/s 04.000

Access the function "Fs1"

ent

3 0-QUICK START
Fs1: m³/s 04.000

Push the key repeatedly to move the cursor to the value to modify

→

4 0-QUICK START
Fs1=dm³/s 04.000

To increase the value press the upper key

↑

5 0-QUICK START
Fs1=dm³/s 05.000

Confirm the new value

ent

6 0-QUICK START
s1=dm³/s 05.000

leave the quick start menu and return to the initial visualization page

esc

7 dm³/s +0.000 1
m/s 0.00-----

Initial visualization page

EXAMPLE: "Main menu" function modification. Full scale value 1 (Fs1) from 4dm³/s to 5dm³/s. (Quick start menu enabled)

1 dm³/s +0.000 1
m/s 0.00-----

Enter in the "Quick start menu"
From any page of the start-up (power on) screens

ent

2 0-QUICK START
s1=dm³/s 04.000

Press the button indicated to enter the Main menu page screen from the Quick menu page

↑

3 0-QUICK START
Main menu

Access to the "Main Menu" by pressing the key indicated

ent

4 0-QUICK START
keycode L2:00000

To enter the main menu input the key code (111111 as default) by increasing the '0' to '1' and moving to the next '0' until the key code is entered

↑
→

5 0-QUICK START
keycode L2:11111

To enter the key code press the lower key

ent

6 MAIN MENU
1-Sensor

To move between main menu function groups press the arrow key indicated

→

7 MAIN MENU
2-Scales

Access the "Scale" menu.

ent

8 2-SCALES
s1=dm³/s 04.000

Access the function "Fs1"

ent

9 2-SCALES
Fs1: m³/s 05.000

Move between the modifiable options

→

10 2-SCALES
Fs1:dm³/s 04.000

Change the value

↑

11 2-SCALES
Fs1:dm³/s 05.000

Confirm the new value

ent

12 2-SCALES
s1=dm³/s 05.000

push to return to the main menu groups

esc

13 MAIN MENU
2-Scales

push to return to the initialization pages

esc

14 dm³/s +0.000 1
m/s 0.00-----

Initial visualization page



SECURITY ON FUNCTIONS ACCESS

ACCESS CODE

Functions in the converter main menu are enabled by the access codes. The information of this manual is related to all the functions available with the L2 level. All the functions available through higher level are protected and reserved to the service.

```
11-INTERNAL DATA
L2 code= *****
```

L2 code = 000000 disable the request of L2 code

L2 customized (6 digits freely chosen by the user) you can program all the functions up to L2; this code will be required to enter in the Main menu.



ATTENTION: take careful note of code, since there is no way for the user to retrieve or reset it if lost. If Code is lost, please refer to ISOMAG SERVICE for unlock code.

Factory pre-setting: L2 CODE=000000 (disabled)

ML 145 MAIN MENU FUNCTIONS

(functions with access code < 3, those with symbol "*" see from page 29)

Attention: The menu functions in grey colour are visualized on display only with other active functions or with optional modules

FUNCTION'S LIST

MAIN MENU

1-Sensor

1-SENSOR		
ND=mm	00025	1.1 Insert ND of sensor (0-3000)
KA=	-01.0000	1.2 Calibration data of sensor visualized on sensor's label
Sens.type=	004	1.3 Sensors model: Enter the first two characters of the serial number of the sensor
Ins.position=	0	1.4 Position for insertion sensors: 0=1/8DN, 1=1/2DN, 2=7/8DN
Ki=	1.0000	1.5 Automatic setting according to ID (insertion meter only)
Kp=	1.0000	1.6 Automatic setting according to ID (insertion meter only)
E.P.detect=	ON	1.7 Enables the empty pipe detection function
E.P.thr.=	100	1.8 Value of empty pipe sensibility detection
Zero cal.		1.9* Enables the automatic zero calibration system
Zero res.		1.10 Reset the preceding value

MAIN MENU

1-Sensor

2-Scales

2-SCALES		
Fs =dm ³ /s	5.0000	2.1* Full scale value measure set for flowrate
Temp.u.meas.=	"F"	2.2 Unit of measure of temperature
Tot1MU=dm ³	1.000	2.3* Unit of measure and number of decimal totalizes
Pls1=dm ³	1.000000	2.4* Pulse value on channel 1
Pls2=dm ³	1.000000	2.5* Pulse value on channel 2
Tpls1=ms	0010.0	2.6* Duration of the pulse generated on channel 1
Tpls2=ms	0010.0	2.7* Duration of the pulse generated on channel 2

MAIN MENU

1-Sensor

2-Scales

3-Measure

3-MEASURE		
Cut-off=%	00.0	3.1 Low flow zero threshold: 0-25% of full scale value
Prof.=	SMART	3.2 Consumption profiles
Damping=	OFF	3.3 Enable/disable measure filtre

MAIN MENU

1-Sensor

2-Scales

3-Measure

4-Alarms

4-ALARMS		
Al.max+=%	000	4.1 Maximum value alarm set for direct flow rate
Al.min+=%	000	4.2 Minimum value alarm set for direct flow rate
Al.max-=%	000	4.3 Maximum value alarm set for reverse flow rate
Al.min-=%	000	4.4 Minimum value alarm set for reverse flow rate
Hyst.=%	03	4.5 Hysteresis threshold set for the minimum and maximum flow rate alarms
MA v.fault=%	010	4.6*Current output value in case of failure

```

MAIN MENU
1-Sensor
2-Scales
3-Measure
4-Alarms
5-Inputs

```

```

5-INPUTS
T+ reset= OFF 5.1* Total direct (positive) flow totalise reset enable
P+ reset= OFF 5.2* Partial direct (positive) flow totalise reset enable
T- reset= OFF 5.3* Total reverse (negative) flow totalise reset enable
P- reset= OFF 5.4* Partial reverse (negative) flow totalise reset enable
1 Count lock= OFF 5.5 Totalise counting lock command
1 Calibration= OFF 5.6* Autozero calibration external command
Inp.Pwr= EXT 5.7 Input power supply ( ON = input power supply from internal battery)
Alarm= OFF 5.8 Alarm from external signal (i.e. flooding/intrusion/..) ON = record the alarm on SD memory

```

```

MAIN MENU
1-Sensor
2-Scales
3-Measure
4-Alarms
5-Inputs
6-Outputs

```

```

6-OUTPUTS
1 Out1= OFF 6.1* Output 1
1 Out2= PLS 6.2* Output 2
Out mA=4_22 6.3 4÷20 mA Output

```

```

5-Inputs
6-Outputs
7-Communication
7-COMMUNICATION
IF2 prot.= DPP 7.1 Choice of the communication protocol for the IF2 device
10-Diagnostic
11-Internal data

```

```

6-Outputs
7-Communication
8-Display

```

```

8-DISPLAY
1 Language= EN 8.1 Choice of the language: EN= English, IT=Italian, FR= French, SP= Spanish
1 D.time=s 060 8.2 Time for switch off display (shown with function 3.7 enabled)
Quick start= OFF 8.3 Visualization of "Quick start menu"
Disp.lock= OFF 8.4 Lock of DISPLAY in ONE SPECIFIC visualization page
T+ reset 8.5* Total direct (positive) flow totalizer reset from keyboard
P+ reset 8.6* Partial direct (positive) flow totalizer reset from keyboard
T- reset 8.7* Total reverse (negative) flow totalizer reset enable from keyboard
P- reset 8.8* Partial reverse (negative) flow totalizer reset enable from keyboard

```

```

7-Communication
8-Display
9-Data logger

```

```

1 9-DATA LOGGER
1 2013/04/04 08:45
Acquisition= ON
Double int.= ON
int.1 =00h10m00s
int.2 =00h01m00s
int.2 = HOURLY
T.ON =00d00h00m
T.OFF =00d00h00m
Log T+= OFF
Log P+= OFF
Log T-= OFF
Log P-= OFF
Log NT= OFF
Log NP= OFF
Log Q= OFF
Log STAT= OFF
M.units= OFF
% values= OFF
Separator= ,

```

9.1* Date and time set
9.2* Automatic data logger enable
9.3 Choice of single (off) or double (on) interval
9.4 Interval time 1 for the data logging function
9.5 Interval time 2 for the data logging function
9.6 Interval period 2 for the data logging function
9.7 Interval 2 start login time
9.8 Interval 2 stop login time
9.9 Enables the direct total totalizer
9.10 Enables the direct partial totalizer
9.11 Enables the reverse total totalizer
9.12 Enables the reverse partial totalizer
9.13 Enables the net total totalizer
9.14 Enables the net partial totalizer
9.15 Enables the flow rate
9.16*Logging of statistical data
9.17 Enables the measure units (technical units)
9.18 Enables the measure units (%)
9.19 Symbol used as separator on CSV files

```

8-Display
9-Data logger
10-Diagnostic

```

```

1 10-DIAGNOSTIC
Sensor test
Self test
Simulation= OFF
Stand-by
Read SDC info
Firmware rev.

```

10.1 Perform a sensor test (SENSOR MUST BE CONNECTED)
10.2* Converter auto-test
10.3* Flow rate simulation enabling
10.4* Stand-by function
10.5 SD card status/info
10.6 Show firmware revision

```

8-Display
9-Data logger
10-Diagnostic
11-Internal data

```

```

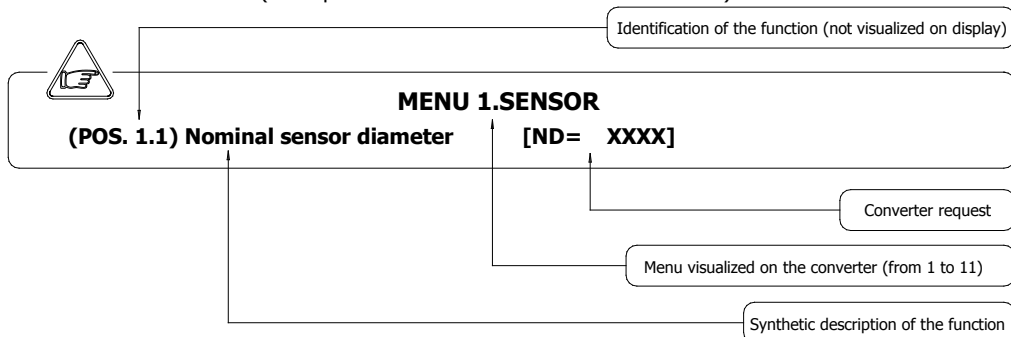
1 11-INTERNAL DATA
L2 code= *****
Load fact.data
KS= +1.0000

```

11.1 Level 2 access code enter
11.2 Load factory data pre-set
11.3 Ks Coefficient

FUNCTIONS DESCRIPTION

(description of the functions with access code < 3)



MENU 1 - SENSOR

(POS. 1.9) "Autozero" calibration

[Zero cal.]

Perform a zero calibration of system. It could be required when the sensor is firstly installed or after a long period when the sensor has been empty. To perform the function it is absolutely necessary to fulfil the sensor and keep the liquid perfectly still. Even a very small liquid movement may affect the result, and, consequently, the system accuracy.

Press the key **ent** and **esc** to confirm the "EXECUTE" request, the function automatically start to get a measure for 60s, then the right value will be calculated and automatically saved; check if the zero is correct, otherwise repeat again the operation. Press **esc** to escape the function.

MENU 2 - SCALES

(POS. 2.1) Full scale

[Fs= dm^3/s X.XXXX]

The Full scale is the maximum flow rate (max 10m/s) and it match the analog output signal (20mA). There are four fields to fulfil to set this parameter, from left to right: 1) volume unit 2) unit type 3) unit time and 4) numeric value. The selection is made by positioning the cursor over the field to modify. To change the measure unit type (metric, British or American, mass or volume) the cursor has to be positioned on the symbol "/" (field N. 2). When the nominal diameter is set to zero it is possible to modify only the numeric field, because the unit of measure is set in m/sec.

The tables below shown the units of measure available and the conversion factor by comparison with $1dm^3$ and 1kg.

The converter accepts any kind of combination of units of measure satisfying both the following conditions:

- Numeric field value ≤ 99999
- $\frac{1}{25} fs_{max} \leq$ numeric field value $\leq fs_{max}$.

where fs_{max} is the maximum full scale value according to the sensor diameter (the max allowed speed is 10 m/s). The measure units are shown as appear on the display. The British and American units are diversified by using capital and small characters.

Available mass and volume units

cm³	Cubic centimetre
ml	Millilitre
l	Litre
dm³	Cubic decimetre
dal	Decalitre
hl	Hectolitre
m³	Cubic metre

in³	Cubic inch
Gal	American gallon
IGL	Imperial Gallon
ft³	Cubic foot
bbbl	Standard barrel
BBL	Oil barrel
IKG	Imperial Kgallons
KGL	US Kgallons
Aft	Acre feet
MGL	USA Mega Gallons
IMG	Imperial Mega Gallon

Oz	Ounce
Lb	Pound
Ton	short tons

G	Gram
Kg	Kilogram
T	Ton

When a unit of mass is selected, the specific gravity function is automatically enabled. Please, note that the temperature heavily affects the mass measure and therefore with certain liquids this may cause significant measurement errors. Time units of measure may be chosen among the following values: **s** = second, **m** = minute, **h** = hour, **d** = day.

(POS. 2.3) Measure unit and number of decimal**[Tot1Mu:dm³ X.XXX]**

This function allow to set the unit of measure and number of decimals displayed for the volumes. To set the unit of measure, position the cursor on field of the measure unit. To set the unit type, position the cursor on the blank space between the measure unit and the numeric value; The number of decimal places can be selected by placing the cursor on numeric field and choosing one of the possible combinations: 1.000-01.00-001.0-00001.

(POS. 2.4-5) Pulse value output 1&2 and unit of totaliz.**[Pls1-2=dm³X.XXXXX]**

Sets the pulses volume to be emitted on digital output 1 and 2. The measure unit is the same than that set with function 'Totalizer' (POS 2.3). To set the parameters, complete the three fields, from left to right: 1) unit of measure, 2) unit type, 3) numeric value. The selection can be done by positioning the cursor over the field to be modified. To change the unit type (metric, British or American, mass or volume) place the cursor on the blank space between the measure unit and the numeric value. If the nominal diameter is set to zero (measure of fluid speed) it is possible to modify only the numeric field because the measure unit is set in meters(m) or feet(ft). Only the units shown on the above table are available.

(POS. 2.6-7) Pulse duration OUTPUT 1&2**[Tpls1-2=ms XXXX.X]**

Set the duration of the pulses of output 1 or 2. The allowed values are between: 8.0ms and 7999.9ms.

MENU 4 - ALARMS**(POS. 4.6) Current output value in case of failure****[mA V.fault =% XXX]**

The output current signal can be specified by the user in case of failure of either, empty pipe, coils interrupted, or ADC error. The signal current is set as a percentage (0 to 120%) of the 0/4-20mA current. 120% corresponds to 24mA and does not depend on the selected range (0-20/4-20mA).

The NAMUR NE43 recommendation asks for a alarms signalling value for the current output lower than 3.6mA (<18%) or bigger than 21mA (>105%). It would then be preferable to set the value of this function at the 10%, so that the current value in case of the a.m. cases would be 2 mA, allowing the following diagnostics:

- current < 2mA - 5%: line interrupted, power supply failure or faulty converter;
- 2mA -5% * current * 2mA + 5%: hardware alarm;
- 4mA * current * 20mA: normal working range;
- 20mA < current * 22mA: out of range, measure above 100% f.s.

Note: To set this parameter to zero disables the alarm

MENU 5 - INPUTS**(POS. 5.1-4) Enable reset partial/total totalizers****[T+/-/P+- reset= ON/OFF]**

When this function is ON, the totalizers could be zeroed remotely.

(POS. 5.6) Autozero calibration external command enable**[Calibration=ON/OFF]**

This function enables/disables the automatic zero calibration system. When this function is active, applying a voltage on the meter's on/off input terminals performs an autozero calibration cycle. ATTENTION: if the voltage pulse is less 1 sec., the meter performs an Auto calibration cycle to compensate for possible thermal drifts. If the voltage pulse is more 1 sec, the meter performs a Autozero measure calibration.

MENU 6 - OUTPUTS**(POS. 6.1-2) On/Off output 1-2****[Out 1-2=XXXXXX]**

Select the functionality of output 1 and 2. The table below shown the code and description

FUNCTIONS FOR OUTPUTS 1 and 2

- OFF: DISABLED
- PLS: PULSE FOR POSITIVE AND NEGATIVE FLOW RATE
- PLS-: PULSE FOR NEGATIVE FLOW RATE.
- PLS+: PULSE FOR POSITIVE FLOW RATE
- F.SIGN: FLOW DIRECTION OUTPUT (ENERGISED = -)
- DIRECT. DR.: DIRECT OUTPUT DRIVE
- ALL ALARMS: ALL ALARMS
- OVR.RANGE.: OUT OF RANGE ALARM OUTPUT (ENERGISED = FLOW RATE OK)
- HARDW.AL.: CUMULATIVE ALARM OUT interrupt coils, empty pipe, meas. error (ENERG. = NO ALARMS)
- P.EMPTY: EMPTY PIPE ALARM OUTPUT (ENERGISED = FULL PIPE)
- MX+MN ALL: MAX AND MIN ALARM OUTPUT (ENERGISED=AL. OFF)
- MX+MN Q: MAX AND MIN FLOW RATE ALARM OUTPUT (ENERGISED=AL. OFF)
- MX+MN Q-: MAX AND MIN NEGATIVE FLOW RATE ALARM OUTPUT (ENERGISED=AL. OFF)
- MIN Q-: MIN NEGATIVE FLOW RATE ALARM OUTPUT (ENERGISED=AL. OFF)
- MAX Q-: MAX NEGATIVE FLOW RATE ALARM OUTPUT (ENERGISED=AL. OFF)
- MX+MN Q+: MAX AND MIN POSITIVE FLOW RATE ALARM OUTPUT (ENERGISED=AL. OFF)
- MIN Q+: MIN POSITIVE FLOW RATE ALARM OUTPUT (ENERGISED=AL. OFF)
- MAX Q+: MAX POSITIVE FLOW RATE ALARM OUTPUT (ENERGISED=AL. OFF)

MENU 8 - DISPLAY**(POS. 8.5-8) Reset totalizer****[T/P+/- reset]**

To reset any totalizers push the key **ent** and at the question "RESET TOTALIZ.?" push the key **esc** to proceed with the zeroing otherwise push any other key to cancel this operation.

MENU 9 - DATA LOGGER**(POS. 9.1) Date and time set****[YYYY/MM/DD hh:mm]**

The data and time set do not remain without power supply and in stand-by (POS. 10.4). The calendar is valid till 2091 year.

(POS. 9.2) Automatic data logging enable**[Acquisition =ON/OFF]**

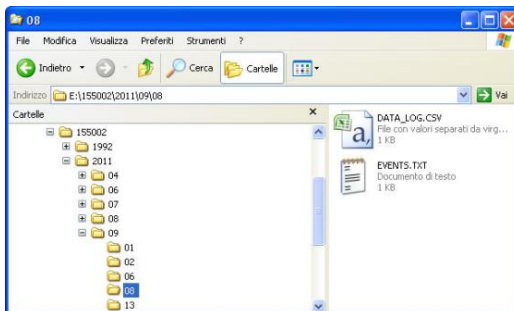
Enables data logging.

Data recorded (to be enabled):

- reference data,
- total positive totalizer, total negative totalizer,
- flow rate, flow rate %,
- partial positive totalizer, partial negative totalizer,
- total net value totalizer, partial net value totalizer,
- battery status

USING DATA LOGGER BY ISOCON INTERFACE

Data are stored on micro SD card; the organization is based on “tree-structure”: the system create a daily folder where it save events and data logger . The data can be downloaded using ISOCON interface.

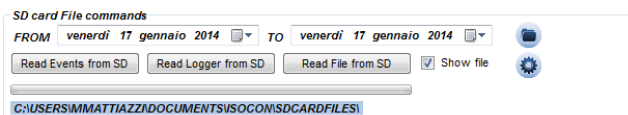


The measure sampling interval is influenced by the data logger interval; with “Energy saving”= ON (only ETP function , ENSVE=1), the minimum allowed logging time is 15 seconds; if “Energy saving” = OFF (only ETP function , ENSVE=1), it can be selected up to 1 second.

ATTENTION: When the logger is set with sampling interval lower than measurement interval, the second one it is automatically adjusted to the same range set on the logger.

This trick could be convenient when the double interval logging is activated: for a “short” period (interval 2), it will be possible to get a massive amount of accurate data (**with consequent huge batteries consumption**) then, automatically, the measure sampling interval will return to the right value.

SD card File commands



Read logger from SD: allows to download the logger from the SD card into the PC file folder shown on highlighted screen in azure; Isocon proposes the file name of the pc date, however it is modifiable to read old loggers, the file formats are: yyyy\mm\dd\DATA_LOG.CSV

Read events from SD: allows to download the events from the SD card into the PC file folder shown on highlighted screen in azure; Isocon proposes the file name of the pc date, however it is modifiable to read old events/loggers, the file formats are: yyyy\mm\dd\EVENTS.TXT

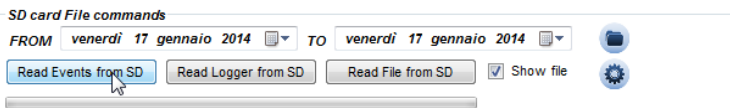
Read file from SD: allows to download any file from the SD card into the PC file folder shown on highlighted screen in azure, the user must know the file name

Show file: the flag selection allows to show the related events, data logger or any other file (when you click on **Read Events from SD**, **Read Logger from SD**, **Read File from SD** or **Write file to SD card** keys)

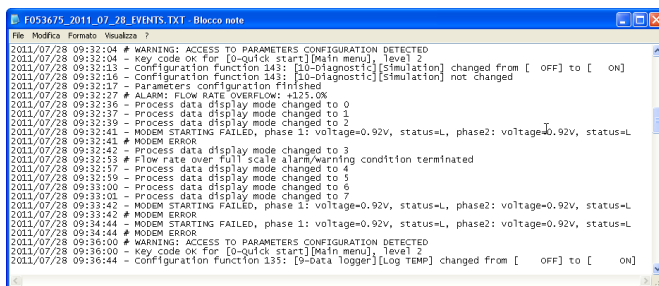
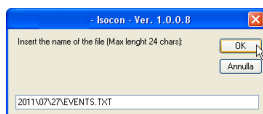
EXAMPLES

1. Events download

To read events from SD memory card: flag the **Show file** option and click on the related reading command.

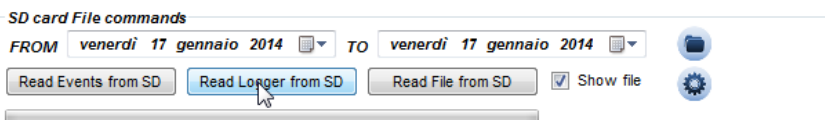


Confirm (or change to view past events, if there are) the file name and click OK.



2. Data logger download

To read data logger from SD memory card: flag the **Show file** option and click on the related reading command.



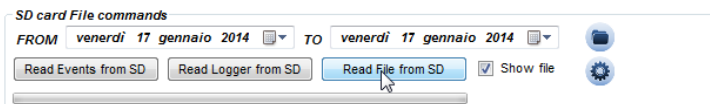
Confirm (or change to view past data logger, if there are) the file name and click OK.

Note: it is recommended the date synchronization between converter and pc to perform correctly the events and logger reading operations.

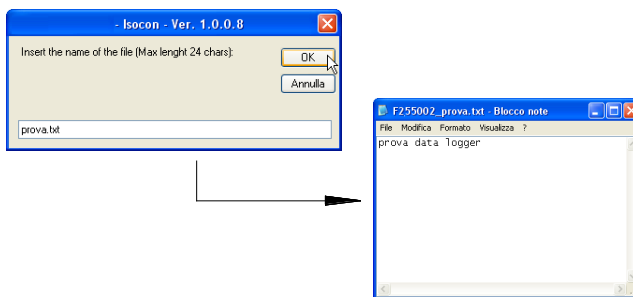
3. File download

To read any file from SD memory card: flag the **Show file** option and click on the related reading command.

ent



Insert the file name and click OK.



MENU 10 - DIAGNOSTIC

(POS. 10.2) "Autotest" function enable

[Self test]

This function stops the meter normal functions and performs a complete test cycle on the measure input circuits and on the excitation generator. To activate this function, after selecting it, push key **↩**, at the question: "EXECUTE?" push the key **↩** to start the autotest, or any other key to delete the operation. The test result is shown on the display. At the end of operation the converter will revert to initial visualization pages. This function is automatically performed switching on the device.

(POS. 10.3) Flow rate simulation

[Simulation]

This function generate an internal signal which simulates a flow, allowing the outputs testing and other connected instruments. A '*S' will appear in the visualization screens when the simulation is running. After enabling it, the flow rate simulation can be:

- ❑ Set and started: by pushing the key **ent** from visualization pages, set full scale % of flowrate, confirm the value and start the simulation by pushing the key **ent**.
- ❑ Finished: by pushing the key **ent** from visualization pages and then pushing the key **esc**.

(POS. 10.4) Stand-by of the meter

[Stand-by]

To activate this function, after selecting it, press the key **↩** and at the request "EXECUTE?" press the key **↩** to activate the instrument stand-by, any other key to delete the operation. To reactivate the instrument is enough press the key of display. The stand-by instrument consumption is about 50µA. The data and time set do not remain in stand-by. It is recommended to enable this function if it will be off for time long periods.



Alarm MESSAGES, CAUSES AND CORRECTIVE ACTIONS

In case of alarms/anomalies check immediately the wiring status.

to see the each any alarm message push the key 

ALARM 1/4:
B2 LOW

Number/quantity of alarms
Alarm message

CODE	MESSAGE	CAUSE	ACTION
000	NO ALARMS	----	----
213	CALIBRATION ERROR	Internal calibration error	If the error is persistent, replace the board
215	SD MEMORY ERROR	The SD card installed is missing, not valid or not formatted	Replace the SD memory, format it or check if it is properly inserted
216	POWER SUPPLY OFF	The power coming from the universal power supply went off	Check the power supply source and the relative cables
217	SD MEMORY FULL	The SD card memory is full (no more space for new data)	Change the SD card memory or erase all the unwanted data
218	S.OUT OVERLOAD	An overload condition is present in the power source that feeds the external sensors and inputs	Check the connections and the external sensors (pressure, temperatures, input circuitry)
220	F.SENSOR ERROR	The system detected one or more errors in the flow sensor	Check the error code in the events log
221	EXCIT.ERROR	The system detected an error in the coils excitation circuit	Check the flow sensor cables, the coils insulation and resistance
222	EL.SIG.ERROR	Error condition on the measuring electrodes	Check the flow sensor cables, the electrodes surface, the grounding and the process
223	P.EMPTY	The system detected an empty pipe alarm condition	Check the empty pipe settings and the process conditions
224	MAX Q-	The Negative flow rate is higher than the maximum threshold value set	Check the maximum threshold negative flow rate alarm value and the process conditions
225	MIN Q-	The Negative flow rate is lower than the minimum threshold value set	Check the minimum threshold negative flow rate alarm value and the process conditions
226	MAX Q+	The Positive flow rate is higher than the maximum threshold value set	Check the maximum threshold positive flow rate alarm value and the process conditions
227	MIN Q+	The Positive flow rate is lower than the minimum threshold value set	Check the minimum threshold positive flow rate alarm value and the process conditions
236	FLOW>FS	The flow rate is higher than the full scale set	Check the maximum full scale set and the process conditions
242	B1 LOW	The battery B1 powering the main board is exhausted	Replace the battery
243	B2 LOW	The battery B2 powering the main board is exhausted	Replace the battery
249	POWER FAILURE	The system experienced a power failure (loss of power)	Check the status of the batteries and all their connections. THIS MESSAGE MAY APPEAR WHEN THE SYSTEM IS SWITCHED OFF WITHOUT PRIOR PUTTING IT IN STAND-BY MODE
250	NO CMD RECEIVED	The command list sent to the instrument does not contain any executable commands	Check the command list and re-send it again
251	FIRMWARE.FILE ERR	The file containing the firmware was received with errors	Re-send the firmware file
252	ALARM INPUT ACT.	The digital input detected an alarm signal condition	Check the process condition
253	CONFIG. ENTERED	The system detects an access to the configuration parameters	Check the events log and do the appropriate action depending on your data protection policy
254	SYSTEM RESTART	The system was restarted after a reset signal	If this message appears after an AUTO-TEST command, it is not an error indication, otherwise check all the connections, the batteries and the grounding
255	SYSTEM STARTUP	The system was started	----

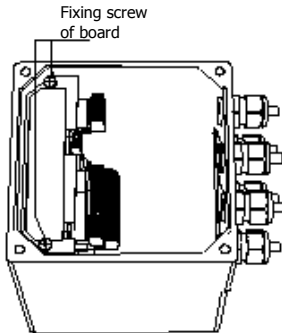
**SYSTEM ERROR CODES (start-up/events log)**

(they may be summed together in hexadecimal codes as for example: 0002+0004+0008 = 000E)

CODE	ANOMALIES DESCRIPTION	ACTION
0001	Keyboard error (key stuck detected)	ADDRESS TO SERVICE
0002	Hardware parameters stored in F-RAM not valid	
0004	Sensor parameters stored in F-RAM not valid	
0008	Converter parameters stored in F-RAM not valid	
0200	Coils excitation current driver error	
0400	Measure input stage error	
1000	Internal time reference error	
0010	Sensor coils resistance out of tolerance	Check the flow sensor status, its working conditions and all the connections with the converter and with the reference ground
0020	Time TC2 out of tolerance	
0040	Time TC1 out of tolerance	
0080	Sensors coils insulation out of tolerance	
0100	Excitation drive phases difference error	
0800	Coils excitation circuit interrupted	Check the connections and the external temperature sensor
2000	Temperature reference error	
4000	External sensors power source overload	Check all the connections between the external sensors (pressure, temperature, digital inputs) and the converters
8000	SD memory error	Check the SD card placement and verify if a compatible type is used

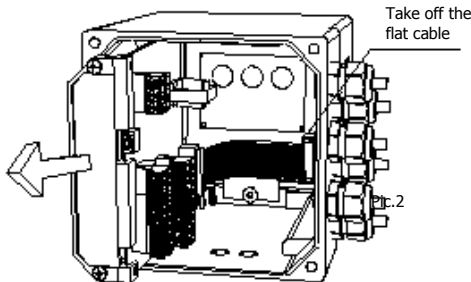


APPENDIX 1 DISPLAY ROTATION PROCEDURE



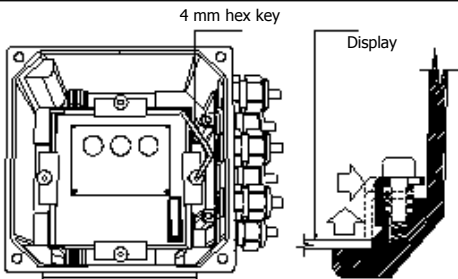
Pic.1

- Verify the absence of power supply, set the converter in stand-by, remove batteries
- Unscrew the screws as indicated in pic. 1



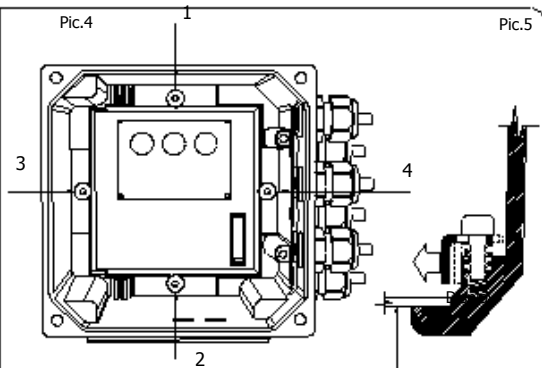
Pic.2

- Lift slowly the board, disconnect the antenna cable from the board and the flat one from the display, pic. 2, finally extract completely the board from the box.



Pic.3

- Partially unscrew the screw fixing the display to allow the angular shift and extraction of the display



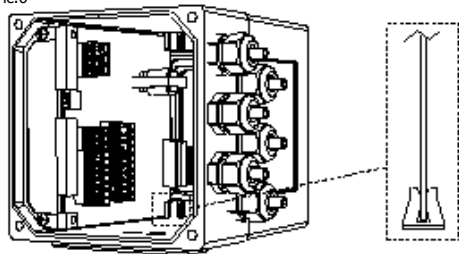
Pic.4

Pic.5

- Rotate the display to the desired location, verify the correct set of the seal, the cleaning of the contact surfaces and place the display in the display housing.
- Place the fixing angles in the suitable positions (pic. 5), restore the antenna cable and screw down firmly until the angles make contact with the display housing.
- Screw up tightly the 4 screws (1,2,3,4) indicated in pic. 4.

Pic.6

Pic.7

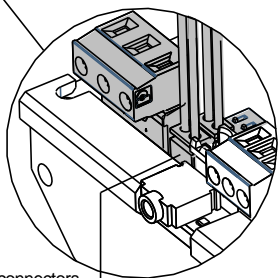
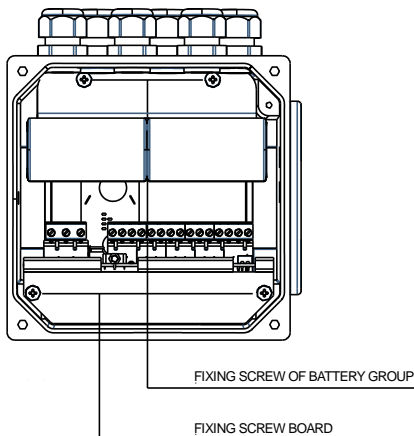
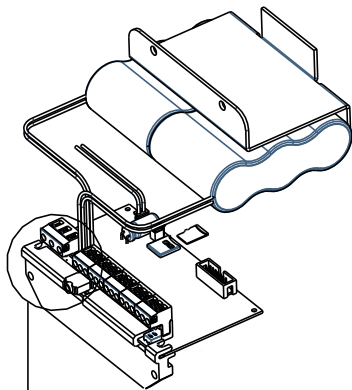


- Restore the flat cable connection to the display
- Verify the board is set correctly in the fixing clip (Pic.7)
- Fix the board to the box to complete the assembly process.

Note: the display is rotatable ONLY in the aluminum IP67 version.



APPENDIX 2 BATTERY SUBSTITUTION



Batteries connectors

- Verify the absence of power supply
- Set the converter in Stand-by (menu 10)
- Extract the battery group unscrewing the frame screws
- Remove the battery connectors
- Mount the new batteries frame
- Re-connect the batteries group connectors

EXHAUSTED BATTERIES MUST BE DISPOSED-OF IN ACCORDANCE WITH LOCAL REGULATIONS

WARNING!!: IF IT IS NECESSARY TO RETURN THE CONVERTER TO THE MANUFACTURER, IT MUST BE SHIPPED WITHOUT BATTERIES INSTALLED. THE BATTERIES ARE CLASSED AS DANGEROUS GOODS AND MUST NOT BE SHIPPED USING REGULAR SHIPPING SERVICES.

SERVICE: return form for instrument repair or calibration

ISOMAG RETURN MATERIAL FORM AND CLEANING UP CERTIFICATE RMA
n° _____

Shipping Address:

ISOIL INDUSTRIA S.p.A.

Via Piemonte, 2

35044 MONTAGNANA (Padova, Italy)

Dear Friend,

to improve the SERVICE QUALITY and the SAFETY, please read, complete and attach this document (RMA) to the material you intend to send. Failure in RMA compilation will not allow us to be able to take charge of the materials.

IMPORTANT NOTICE

For the return **it is prohibited** to ship the product with the discharge batteries inside. The discharge batteries must be removed and disposed in your care; if you do not know the disposal procedure you can contact our service. If the batteries are fully charged again, the transport can be made attaching to the basic transport document, the document that follows this RMA (which you should copy on letterhead A4)

Sender: _____ **Ref. D.D.T. n.** _____ **of** ____/____/____

- A detailed set of instructions for testing the sensor isolation and continuity is given in the service manual. If you are experiencing problems that are not related to the physical integrity of the sensor (water ingress, body, liner, connector or electrodes damage for example) we kindly ask you to test the sensors isolation and continuity. If the sensor passes these tests then we ask you to consider not returning this sensor without first consulting isomagservice@isoil.it
- In the case that the converter or sensor is returned and it is not repairable inside the warranty agreement terms or the inspection report is not accepted a cost for any converter testing and sensor dry testing and inspection will be mandatorily debited.
- Please send the sensor clean from medium. Additionally please inform about eventual medium wastes remaining in the sensor. For this purpose please use this form.
- A safety specification sheet of the medium must accompany this repair note in the following cases: toxic, otherwise dangerous or objectionable medium, or medium belonging to any dangerous material class.

- Please note that the instruments sender will be charged for any necessary cleaning costs. Additionally, we reserve the right to send the instruments back to the sender for cleaning!
- Please kindly state the observed failure and, eventual causes.

Sensor: MS _____ **Serial number:** _____

Failure description: _____

Converter: ML _____ **Serial number:** _____

Failure description: _____

We herewith confirm that above mentioned sensor has been cleaned and it is therefore free of any liquid and/or solid wastes of the measuring medium and/or cleaning medium. Any eventually remaining wastes are:

Measuring medium:

harmful/ injurious **no** **yes; in this case, safety specification sheet must be attached!**

Sensor cleaned with:

_____ **Date** _____ **Company stamp** _____ **email address** (for questions)

Signature of person in charge

TRANSPORTATION DOCUMENT
(Road part – In accordance with ADR)

Sender _____

Refer document DDT (Delivery note) n. : ___ of: _____

Destination _____

Description of the goods

ONU Number	UN 3091
Official Description	METAL LITHIUM BATTERY IN EQUIPMENT
Class	9
Group of packing	II
Tunnel Code restriction	E

Packing _____

Total quantity of dangerous goods: net weight kg (each battery weighs 0.093kg, this weight is multiplied by the number of batteries contained in the converter)

- **The quantity does not exceed the limits of exemption** prescribed in:
1.1.3.6
- Transport in accordance with: 1.1.4.2.1

Date _____

Signature

CONFORMITY DECLARATION

ISOIL Industria spa

declares that the product line:

ISOMAG ™

converter model:

ML 145

and sensor models:

MS 501 – MS 600 – MS 1000 – MS 2410 – MS 2500 – MS 3770 – MS 3800 – MS 5000

to which this declaration refers, are in compliance with the following Harmonized European Norms:

- **EN 61010-1:2010**
- **EN 61326-1:2006**

and therefore comply to the following CE requirement directives:

- **2006/95/CE (Low voltage directive – LVD)**
- **2004/108/CE (Electromagnetic Compatibility Directive – EMC)**

15/10/2013


THE LEGAL REPRESENTATIVE

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